detected for long distances. An effect was obtained at over half a mile from the vibrator.

(3) *Waves along Wires.*—The uses of fine steel wires for examining the distribution of currents along wires are explained.

(4) *Damping of Oscillations.*—A method of determining the damping of discharge circuits is investigated. The absorption of energy in spark gaps is deduced, and the apparent resistance of the air break to the discharge determined.

(5) *Resistances of Iron Wires.*—Quantitative results are given for the resistance of iron wires for very rapid alternations. The value of the permeability of the different specimens is deduced, and it is shown to vary with the diameter of the wire and the intensity of the discharge.

(6) *Absorption of Energy by Conductors.*—The absorption of energy of iron and non-magnetic cylinders placed in solenoid through which a discharge passed were determined. Iron cylinders were found to absorb much more energy than copper ones of the same diameter, and the permeability of the iron for the discharge is deduced.

(7) *Determination of the Period of Oscillation of Leyden Jar Discharges.*—A method of accurately determining the period of oscillation is based on the division of rapid alternations in a multiple circuit, one arm of which is composed of a standard inductance, and the other of a variable electrolytic resistance.

The value of n, the number of oscillations per second, when the currents in the branches of the multiple circuits are equal, is, under certain conditions, given by—

$$n = \frac{R}{2\pi W},$$

where R = resistance of electrolyte to the discharge,
W = value of the standard inductance.

The value of the self-inductance and capacity of the discharge circuit for very rapid oscillations may also be experimentally deduced.

"Magnetisation of Liquids." By John S. Townsend, M.A. Dub. Communicated by Professor J. J. Thomson, F.R.S.

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(Abstract.)

The experiments on the coefficient of magnetisation of liquids were made with a sensitive induction balance. Both circuits were commuted about sixteen times a second, so that very small inductances could be detected by the galvanometer in the secondary circuit. The principle of the method consisted in balancing the increase of the

mutual induction of the primary on the secondary of a solenoid arising from the presence of a liquid in the solenoid against known small inductances. Thus, if the sum of the inductances be reduced to zero, as shown by the galvanometer in the secondary giving no deflection, the balance will be disturbed to the extent $4\pi k\mathrm{M}$, due to the insertion of a liquid into the solenoid whose coefficient of magnetisation is k, and the galvanometer in the secondary circuit will give a deflection when the commutator revolves. An adjustable inductance is then reduced by a known amount, m, till the deflection disappears; so that we get

$$4\pi k\mathrm{M} = m \qquad\qquad \therefore\ k = m/4\pi\mathrm{M},$$

where m and M are quantities easily calculated.

Since the formula does not contain either the rate of the rotation of the commutator nor the value of the primary current, no particular precautions are necessary to keep these quantities constant.

In all the determinations the magnetising force was varied from 1 to 9 centigram units, and in no case was there any variation in k. The densities of the salts in solution were also varied over large ranges, and showed that the coefficient of magnetisation for ferric salts in solution depended only on the quantity of iron per c.c. that was present, giving the formula

$$10^7 k = 2660\,\mathrm{W} - 7{\cdot}7$$

for ferric salts, where W is the weight of iron per c.c., the quantity $-7{\cdot}7$ arising from the diamagnetism of the water of solution.

A similar result was obtained for ferrous salts, the corresponding formula being

$$10^7 k = 2060\,\mathrm{W} - 7{\cdot}7,$$

the temperature being 10° C.

The following table shows the coefficient of magnetisation for the different salts examined, w being the weight of the salt per c.c. of the solution:—

	$10^7 k$.
Fe_2Cl_6	$916\,w - 7{\cdot}7$
$Fe_2(SO_4)_3$	$745\,w - 7{\cdot}7$
$Fe_2(NO_3)_6$	$615\,w - 7{\cdot}7$
$FeCl_2$........	$908\,w - 7{\cdot}7$
$FeSO_4$	$749\,w - 7{\cdot}7$

The effect of temperature was also estimated, the results of the experiments being shown by means of a curve (fig. 1), the x ordinates of which denote the temperature, and the y ordinates are proportional to the coefficient of magnetisation, a length corresponding to 50 being subtracted from each for convenience of representation.

The first is drawn from results of experiments performed on ferric chloride containing 0·086 gram of iron per c.c., the second from ferrous chloride containing 0·148 gram of iron per c.c., the third from ferric sulphate containing 0·105 gram of iron per c.c., and the fourth from an alcoholic solution of ferric chloride.

The curves all show about the same temperature coefficient at points corresponding to the same temperature.

"On Fertilisation, and the Segmentation of the Spore, in *Fucus*." By J. BRETLAND FARMER, M.A., Professor of Botany at the Royal College of Science, and J. Ll. WILLIAMS, Marshall Scholar at the Royal College of Science, London. Communicated by D. H. SCOTT, M.A., Ph.D., F.R.S. Received May 21,—Read June 18, 1896.

The object of the present communication is to give an account of the chief results of an investigation into the processes connected with the formation and fertilisation of the oospheres and the germination of the spore in *Ascophyllum nodosum*, *Fucus vesiculosus*, and *Fucus platycarpus*. The more obvious details of development have been especially studied by Thuret, and later by Oltmanns. But neither of these writers paid any special attention to the behaviour of the cell-nuclei, nor did they succeed in observing the actual process of fertilisation. Behrens has communicated an account ('Ber. d. Deutschen Bot. Gesel.,' Bd. IV) of some researches made by himself on the fertilisation of the oospheres, but we are unable to accept his conclusions for reasons shortly to be recounted.

The material for these investigations was obtained in London from Bangor, Plymouth, and Jersey, but it was compared with other material collected and fixed at the seaside at Bangor, Weymouth, and Criccieth. Furthermore, all the growing apices and conceptacles for sectioning were collected by one of us directly at the three last named places. Some samples were gathered between the tides, and fixed at once, others were first kept for a time in salt water; the best results, however, were obtained from plants collected in a boat about two or three hours after the tide had reached the plant, and also from other plants taken a short time before they were left exposed by the ebb tide.

In order to study the fertilisation and germination stages, male and female plants were kept in separate dishes, and were covered over so as to prevent drying up. This method gave far better results than those more usually advocated. On the appearance of the